THURSDAY, NOVEMBER 20, 1919.

VERTEBRATE EMBRYOLOGY.

Text-book of Embryology. Vol. xi. *Vertebrata with the Exception of Mammalia.* By Prof. J. Graham Kerr. Pp. xii+591. (London: Macmillan and Co., Ltd., 1919.) Price 31*s*. 6*d*. net.

THE second volume of this important text-book of embryology deals with all the vertebrate groups with the exception of the mammalia. It is unnecessary to say that a more highly qualified authority than Prof. Graham Kerr to expound the many intricate problems of the subject could not be found, but what does impress the reader is the clear insight into the depths of these problems that the author has gained by his own detailed and important original investigations.

It is not surprising to find that, in this comprehensive treatise, the archaic but unfortunately inaccessible mud-fish—Lepidosiren—plays a predominant *rôle*, and that our old friends of the embryological laboratory—the chick and the tadpole—are relegated to minor parts; but Prof. Kerr convinces us that this is as it should be.

The highly specialised vertebrates that we can get in abundance for our class work are not the best types in which to search for the clues to the solution of the many problems of vertebrate embryology. It is rather in the more archaic forms with larger histological elements and a primitive anatomical structure—such as the Dipnoi, the Ganoidei, and the Urodela—that the embryologist has found by experience that he obtains his most satisfactory results.

The need for a text-book of this description which deals fully with the fundamental problems of embryology, as distinct from a text-book that deals only with the development of a few selected types, has long been felt, and a brief reference to one or two of these problems may be given to indicate the manner in which the author expounds them in the light of modern embryological research.

There has been no more highly controversial problem in embryology than the question of the origin of the nerves from the central nervous system. Prof. Kerr describes in some detail the result of his own researches on the development of the motor nerves of Lepidosiren, and gives a critical summary of the theories of His, Balfour, and Hensen. His own opinion is finally expressed and may be very briefly indicated by the following sentence (p. 111): "It is suggested that the development of the actual nerve fibril is simply the gradual coming into view of a pathway produced by the repeated passage of nerve impulses over a given route."

The origin of the paired appendages of vertebrata is another of these debated problems on which distinguished morphologists have held very divergent views. Here, again, the author sets before the student the "branchial theory" associated with the name of Gegenbaur, and the continuous "lateral fin" theory which was supported by Balfour, before expounding his own views in what he calls the "external gill hypothesis." This hypothesis is based on the supposition that the external gills extended further back than they do in any living vertebrate, and that, being potential organs of support, and also potential organs of movement, as indicated by their flicking movements in some existent larvæ, they became transformed into purely locomotive and supporting paired appendages. The limb girdle on this hypothesis is a modified branchial arch skeleton, shifted backwards as in the theory of Gegenbaur.

With the lateral fin theory already so well established in this country, it is not likely that Prof. Kerr will find his views in this matter generally accepted, but there is so much that is interesting and ingenious in the way in which his hypothesis is expounded that the student must benefit by its careful consideration. There are many other problems of absorbing interest, to which space does not permit us to refer, discussed in the spirit of just consideration of the views of previous writers, and a clear expression of the author's own opinion. This is the feature which commends the volume most strongly to the student who is capable of appreciating something more than a plain statement of the facts that have been discovered.

But a word of high praise must also be given for those parts of the work that are purely descriptive. It is always a difficult matter to condense into the allotted space the main results of exhaustive researches, but Prof. Kerr has accomplished this part of the task with great skill and judgment. In some cases, perhaps, a little more expansion would have been advisable. For example, in the chapter on the development of the brain a fuller explanation, with a figure, of what is meant by the term "Archipallium" would be most useful, or, again, in the description of the development of the vertebral column of Sphenodon, in which the student, puzzled by the myotomes being opposite to the protovertebræ in Fig. 152 C, but alternate with them in Fig. 152 B, will find no key to the puzzle in the text. But minor criticisms such as these seem out of place in reviewing a book which has so many merits.

We are glad to find that in writing this text-book Prof. Kerr has not withheld from us the fruits of his ripe experience as a teacher and investigator, for we find in chap. x. a most excellent general account of the development of the chick, illustrated by many good figures, and accompanied by practical instruction in laboratory methods. This chapter will prove to be of great value to the beginner and to his teachers. Moreover, in the last two chapters we are given most interesting and useful comments on the practical study of the embryology of the lower vertebrata and on the guiding principles of embryological research. Prof. Kerr has rendered a great service to scientific students by the publication of this

©1919 Nature Publishing Group

volume, a volume which undoubtedly will take a high rank among modern text-books of zoological science. It is something better than a mere text-book of embryology, as it deals very fully with many of the most important principles of biological philosophy, and will prove very useful as a guide for practical research work in other branches of zoological science. S. J. H.

THE RARER ELEMENTS.

(1) *The Analysis of Minerals and Ores of the Rarer Elements for Analytical Chemists, Metallurgists, and Advanced Students.* By Dr. W. R. Schoeller and A. R. Powell. (Griffin's Scientific Text-books.) Pp. x+239. (London: Charles Griffin and Co., Ltd., 1919.) Price 16*s.* net.

(2) *The Metals of the Rare Earths.* By Dr. James Frederick Spencer. (Monographs on Inorganic and Physical Chemistry.) Pp. x+279. (London: Longmans, Green, and Co., 1919.) Price 12*s.* 6*d.* net.

THE two volumes before us, taken together, form a very complete treatise on the rarer elements, their occurrence, properties, and the methods for their separation. Although they overlap in some measure, each contains much information of the highest importance at the present day.

The practical value of many of the rarer elements has recently been brought into prominence, and it is becoming increasingly plain that, locked up in these little-known minerals widely distributed over the earth's surface, there are elements possessing properties of hitherto unrealised value and importance.

Radium has shaken the old conceptions in chemistry and physics to their very foundations. Uranium, tungsten, tantalum, molybdenum have given us steels which have profoundly influenced the engineering trades and the production of artillery. Thorium and cerium have preserved the gas industry as a means of illumination. Cerium and the rare earth metals rendered us almost independent of the lucifer match. These are but a few indications of the potential value of the rarer elements.

(1) This volume, which naturally comes first, deals exhaustively with the minerals from which the rarer elements are derived, and gives very clear and practical instructions for their recognition, and the properties, chemical reactions, and method for separating the elements. The design of the work is distinctly original, and the authors have included as much trustworthy information about each element as is available at the present time, together with descriptions of the spectroscopic, magnetic, electroscopic, and other apparatus used in research. It is abundantly clear that they have a very practical acquaintance with their subject; novel chemical and physical reactions are given that are apparently taken direct from the laboratory note-books.

The elements are taken in the order of their groups in the periodic system, and the text is arranged under two headings—"General Information," which includes spectroscopic and other physical reactions; and "Mineral Analysis," including qualitative and quantitative estimations and chemical reactions.

There is no general index, but in its place two lists are produced, one giving the names of nearly two hundred minerals containing rare elements, and the other the various methods for separating them from the bodies most frequently accompanying them.

A table of atomic weights and gravimetric factors is included.

(2) The title of this volume strikes one as a little inappropriate, for the metallic properties of the rare earth elements are those about which least is known, but the author is to be congratulated upon having collected together the essential details of all that is known in the domain of the "Rare Earths."

This field has a fascination of its own, quite apart from any utilitarian considerations; that is only realised by those who have worked in it; so great is that fascination that it has claimed the best energy of some of the most honoured men of science. Berzelius, Nilson, Clevé, Lecoq de Boisbaudran, Delafountain, Moissan, Crookes, Urbain are only a few that have fallen under the spell of the "Rare Earths." The work, hitherto exceedingly difficult on account of the rarity of the minerals needed, has been greatly facilitated by the development of the "mantle" industry, because in the extraction of the very large quantities of thorium and cerium needed for that purpose, all the members of the rare earth group are thrown out as by-products, and can be procured with comparative ease.

The substantial monograph under notice is an advance upon any of the excellent works that have recently appeared on the subject. The most remarkable feature in the volume is the great number of references to authorities that are given; these number as many as 1029, and will be found of very great value to the student, enabling him easily to consult the original memoir.

The author's remarks, though good, are sometimes liable to be misleading; in this connection we notice that, in reviewing the work of the late Sir William Crookes on the rare earths, and the suggestion there put out as to the possible existence of "meta-elements," the author states on page 7 that Crookes, by fractional precipitation, obtained seven fractions of different basicity which had different absorption spectra, which he called meta-elements. This may be a clerical error by the use of the term "absorption" instead of "phosphorescence," for the matter is quite correctly stated on page 66.

In point of fact, Crookes's contention was that the purest yttria obtainable gave under the cathodic discharge, *in vacuo*, a discontinuous spectrum consisting in numerous more or less nebulous coloured bands, and that by fractionating this material it was possible to separate these band-

©1919 Nature Publishing Group